to finding the difference of density between two mixtures of alcohol and water of different strengths. It was found that pure butter, at 15° C, would remain in equilibrium in alcohol of 53.7 per cent. This corresponds to specific gravity 0.926. This butter was obtained from a gentleman, at whose country place the butter was made. I obtained oleomargarine from melted warm beef suet by pressure. At a temperature of 25° C, this expressed fat had the consistency of butter. The alcohol which at 15° C, would hold it in equilibrium had a strength of 59.2 per cent., which corresponds to a specific gravity of 0.915.

The question of the possibility of distinguishing butter from oleomargarine becomes equivalent to the possibility of distinguishing alcohol of 53.7 per cent., from alcohol of 59. 2 per cent. As this difference is 5.5 degrees of Gay Lussac's alcohometer, it is very evident that the specific gravity is a sufficient character for distinguishing butter from oleomargarine. This difference may appear more clearly to persons not familiar with alcohometry by stating that it is the difference between 0.926 specific gravity and 0.915.

By means of the tables of Gay Lussac and of Tralles,* it is a very easy matter to prepare alcohol of the required strength at any temperature, to be kept in bottles for future use.

As the expansion of fats is different from that of alcohol, it is advisable to bring the alcohol to 15° C, when making an observation, which can be easily done by any one provided with a thermometer.

To deliver the sample of fat on the alcohol, I have found that the best plan is to melt the fat and let a large drop of it fall into the liquid. The fat should be melted in a little spoon or a little scoop, and the drop should be delivered by bringing the spoon or scoop close to the surface of the alcohol. It requires a little practice to do this neatly, so as not to get an air bubble in the ball of melted fat. When an air bubble becomes imprisoned in the fat, I have had no difficulty in removing it with a strip of paper, while it lies on top of the alcohol. Sometimes the globule of fat only partially sinks in the alcohol; the top of it becomes flat and remains exposed above the liquid. A slight tap on the side of the glass is then generally sufficient to form a wave and sink the globule.

If we take alcohol of 56½ per cent., which represents equal volumes of alcohol of 53.7 per cent., and of 59.2 per cent., and if we deliver on the surface of this alcohol a globule of melted butter and one of oleomargarine, the butter will sink to the bottom and the oleomargarine will remain at the top, while the two globules are still warm and liquid. Afterwards, if the alcohol has a temperature of about 30° C, the butter will become solid, while the oleomargarine may still remain liquid. Then the butter will rise to the top of the alcohol, which is due to the expansion of butter on solidifying. If the alcohol be then kept for a few minutes, at 15° C, the oleomargarine will become opaque and remain at the top while the solid globule of butter will sink to the bottom.

If instead of taking alcohol of 56 per cent. we use alcohol of 59.2 per cent., oleomargarine will remain on top and butter will sink to the bottom at all temperatures above 15° C. At 15° C., oleomargarine will remain in eqilibrium in any portion of the liquid in which it may be placed.

If oleomargarine was always sold pure, the foregoing indications would be sufficient to distinguish it from butter, but the oleomargarine found in the market is always more or less mixed with true butter to improve its taste and appearance. This being the case, alcohol of 59 per cent. is not the proper liquid to detect oleomargarine. We should use alcohol of 55 per cent. and consider as oleomargarine any so called butter which will not sink to the bottom in alcohol of this strength at 15° C. This is founded on the fact that not more than ⅓ of butter is ever mixed with oleomargarine to improve its taste and appearance.

*See the excellent tables of Prof. Mc. Culloh.

Bearing in mind the experiments of Messrs. Leune and Harburet, already cited, the proportion of butter and of oleomargarine in a mixture could be easily detected by finding what strength of alcohol will hold in equilibrium at 15° C, a globule of fat under examination. As the difference of 59.2 and 53.7 is 5. 5, the proportion of oleomargarine is the difference between the strength of the alcohol and 53.7, divided by 5.5, or more conveniently multiplied by 0.18. If the alcohol required to hold a globule of fat in equilibrium at 15° C, has a strength of 57 per cent., then: $(57-53.7) \times 0.18 = 3.3 \times 0.18 = 5.95$, or say $\frac{6}{10}$ of oleomargarine. If the alcohol had a strength of 58, then $58-53.7 \times 0.18 = 4.3 \times 0.18 = 7.72$, or about $\frac{8}{10}$ of oleomargarine.

The proportions of butter and oleomargarine in a mixture may be also determined without the aid of an alcohometer, by using the two solutions of 53.7 per cent. and of 59.2 per cent. These may be placed in graduated glasses and poured cautiously into a third glass, until an alcohol of sufficient strength is obtained to keep in equilibrium a globule of the fat under examination at 15° C.

The relative volumes of the two solutions used in making the mixture, give the proportions of butter and oleomargarine.

The accuracy of these calculations rests entirely on the results obtained by Messrs. Leune and Harburet. I have not verified them by experiment, and I do not clearly see their utility. When we buy butter it is interesting to know whether what we buy is pure butter or not. It is no palliation to the offence of selling oleomargarine for butter that the oleomargarine contains ¼ or ⅙ of real butter.

FILARIA OF THE HUMAN BLOOD.

The members of the Pathological Society, of London, recently enjoyed the rare opportunity (in this country) of seeing the filaria sanguinis hominis in the living state from a patient in the London Hospital suffering from hæmato-chyluria, under the care of Dr. Stephen Mackenzie. They were also enabled to hear from Drs. Cobbold and Vandyke Carter the facts at present known concerning filarious disease, whilst the observations related by Dr. Mackenzie, most patiently and carefully pursued for two months upon the case in question, were a valuable addition to these facts. In one important point these observations have resulted in a further discovery, to which we shall refer again. Our present purpose will be simply to gather up briefly the facts as detailed by these speakers, and to indicate their bearings upon the pathology of the obscure affections of the lymphatic system with which they are connected. In the first place we have now—thanks to the discoveries of Bancroft, Lewis, and Manson —a complete knowledge of the life history of the parasite. Like so many similar creatures, it presents us with an example of alternation of generations; or more correctly speaking, of the need of two hosts for its full development. The minute almost structureless worms found in the blood of the human subject in such vast numbers are the *embryonic* forms of the filaria which requires the mosquito in which to develop into the sexually mature worm. The mosquito feeding on the blood at night, when the filariæ are generally alone to be found, becomes gorged with them. Their growth in the mosquito has been traced by Lewis and Manson, and it is presumed that they are only liberated from the body of their host by its death in the water to which it always finally resorts. The nematoid is thus set free, and possibly undergoes further development; for the mature worm measures some three inches in length. Its passage into the human body is easily explained; and the analogy in this respect with the larger nematoid—the guinea-worm—is one which Dr. Vandyke Carter ably illustrated. Once within the human body, the worm lodges in the tissues, but as to its migrations, and, indeed, its ultimate resting-place, but little is known. It

would seem, from its discovery in a lymphatic abscess by Bancroft, and in a lymph scrotum by Lewis, to have a peculiar aptitude for selecting the lymph channels for its habitat; a selective power not more remarkable than that which urges the trichina to lodge in muscular tissue. This is further borne out by the fact that its embryos—the filaria sanguinis hominis—are met with in the blood and the urine of the subjects of chyluria and nævoid (or lymphatic) elephantiasis.

Now, although the various discoveries which have been made—at the expense of so much patient research and at such various times that, as Dr. Cobbold remarked at the meeting, they form each distinct "epochs"—have enabled us to form the above complete sketch of the life-history of the parasite, there are lacunæ still to be filled up. Thus knowledge is wanted upon the growth and migration of the parent worm after it has gained entrance into the human body, also as to its duration of life, and particularly as to the question whether it can take on the power of a sexual reproduction, and if so, for how long a time. The myriads of filariæ that are probably daily reproduced in the body of such a patient as that under Dr. Mackenzie's care seem to demand such a fact as alternate generations, and also to raise the question as to the time during which the process of reproduction can continue. There is no reason to believe that the embryonic filariæ in the blood can undergo further development within the human body; indeed, analogy, as well as the remarkable discovery of an intermediate host in the mosquito, are opposed to this notion. Again, filariæ have been found in the blood apart from chyluria or any outward manifestation of lymphatic derangement; but this is explicable if it be admitted that the adult worms may lodge in other parts of the body in communication with blood vessels alone. Conversely, chyluria may exist without filaria, and the case mentioned by Dr. Mackenzie, where the parasite was found in the man's blood in India, but could not be found when he came to England, is explicable on the view that though the parent organism might have perished, or yielded no more embryos, yet the change excited by its presence in the lymphatic channels, and therefore the chyluria, might still have persisted.

The precise mechanism of chyluria still requires to be explained, and until it is elucidated an important part of the subject will remain obscure. The question of the pathology of chyluria was, however, barely touched upon on Tuesday, Dr. Mackenzie limiting himself to the statement of the facts observed in his case; the most important in connection with the urine being that besides having all the chylous characters, it invariably contained more or less blood,—that passed by day containing more blood and filaria, that passed by night being more milky; and that filariæ were found in it, especially in connection with blood coagula. The most remarkable feature of the whole case lay in the periodicity shown by the filariæ in their time of appearance in the blood. During the whole period of the man's stay in the hospital his blood had been examined regularly every three hours, with the constant result that, by night, the filariæ abounded and by day were entirely absent. From 9 A. M. to 9 P.M. they were absent; they appeared at the latter hour and increased up to midnight, then decreased till at the first-named hour none were found. These observations entirely confirmed those of Manson, and particular stress was laid upon their nocturnal wanderings and the habits of the mosquito. It is certainly singular that the time selected by the mosquito should coincide with the presence of the parasite in the blood stream, and the connection of these two facts is not the least wonderful chapter in the life-history of the parasite. But whatever the explanation of the periodicity—Dr. Vandyke Carter pointed out that it was not invariable,—a valuable addition to our knowledge of it has been made by Dr. Mackenzie. He found that whereas the time of ingestion of food bears no relation to it, it is otherwise with the time of rest and sleep, for when the patient was up during the night and slept during the day the period of filarial migration was similarly inverted. Dr. Mackenzie did not venture to speculate upon these curious points. He wisely contented himself with laying the facts he had observed before the Pathological Society.—*Lancet.*

A VERY REMARKABLE METEOR.

On the evening of Wednesday the 16th, while sweeping the western heavens in search of comets, I was startled by a brilliant illumination to my right; looking up hastily, a bright meteor was seen moving rapidly along the north-eastern heavens. It started from a point about 3° north of Capella, and, traversing a path of about 10°, passed some 2° above *delta Aurigæ*. The flight of the meteor did not exceed three seconds, when it burst with a dazzling brilliancy, to be compared only to the whiteness of the electric light. At the moment of exploding it must have been at least five or six times brighter than Venus at her maximum. There remained in its wake—covering the full extent of its path—a thin reddish train; this drifted slowly among the stars towards the north-east, gradually collecting into a lightish cloud at its N.E. end. Noting the remarkable permanency of the train, I turned the telescope (a 5-inch refractor) upon it, and was surprised to see a very brightly glowing mass of pinkish smoke; the same material lay stretching out toward the southwest in a long, straggling strip; this trail was about one-fourth a degree in thickness, and could plainly be seen with the telescope for a distance of at least ten degrees. This mass of smoke drifted northeasterly over the stars, curling slowly, like a mighty serpent. It was knotted in several places with cumulous forms which were due probably to minor explosions in the meteor. The outlines of this wonderful train of celestial smoke were well defined; it did not diffuse itself in the atmosphere, but faded gradually from view. During the whole of its visibility it retained its pinkish color. The appearance of the meteor was at 48m. past 6. The train remained visible to the naked eye for about six minutes. In the telescope it was very distinct up to seven o'clock. At three minutes after seven it was still visible in the instrument. Meanwhile it had drifted about 4° to the north-east, becoming more crooked each moment as it curled about in the air. The remarkable duration of the train of smoke from this meteor—over fifteen minutes—deserves being recorded. E. E. BARNARD.

NASHVILLE, Tenn., *November* 21, 1881.

INSTRUCTIONS ISSUED BY THE INTERNATIONAL CONFERENCE FOR THE OBSERVATION OF THE TRANSIT OF VENUS OF 1882.

Contributed by M. BENJAMIN, Ph. D.

ARTICLE I.—It is desirable, from a theoretical standpoint, that the telescopes used should be of as large aperture as possible. In practice, the difficulty of transportation on the one hand, and the necessity of observers at different stations having similar instruments, limits the apertures to from 0.12 metre to 0.15 metre (about 4½ to 6 inches).

In all cases the objectives should be as perfect as possible. Observers should give an exact description of the quality and defects of the objective, as also the eye-piece employed. Towards this end they should determine:

1. The form of the image of a good star in focus, as also the image of the same star at a point before and after coming into focus.

2. The separating power of the objective for double stars.

It will be useful to know also if the telescope is able to show the solar granulations on any favorable opportu-